

**Appendix 4-11: Scope of Work
for Programming Support to
Automate the Calculation of Water
Budgets for Each Treatment Cell
in the STAs**

Response to Work Order Request W-EM-0104D



Prepared for

South Florida Water Management District

Version 3.0



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Executive Summary

Project Summary

The Resource Assessment Division (RAD) of the Environmental Monitoring and Assessment Department (EMA) produces approximately 300 reports per year, maintains the District's major environmental database, DBHYDRO, provides data, reports and District-related information to the public and implements the latest proven technology for remotely gathering environmental data, e.g. a system-wide measurement of rainfall using radar (NEXRAD) and remote sensing at low altitudes. The quantity of data collected by the District has been constantly increasing and the demand for data, data analysis and reports on hydrometeorologic and water quality conditions within the District has also increased, particularly since the 2000-2001 drought and the recent inception of many CERP projects. In addition, RAD staff work on Everglades Restoration and CERP projects that require specific programs to evaluate large water quality and hydrologic data sets, do data calculations and provide automated data retrievals for running models.

Job Summary

Continue automating RAD's water quality and hydrologic reporting and data analysis functions as well as accomplish programming needs for the Database Programming & Design Section. The tasks to be completed, in order of priority, under this contract from February 16, 2004 through December 31, 2004 are listed below: Radiant Systems, Inc. will not have a permanently assigned workspace at SFWMD. Radiant will provide their own computer and make arrangements for an Internet Service Provider. The majority of the work will be performed off-site with connectivity to the District network via SFWMD Virtual Private Network (VPN). DSL or cable modem Internet access is recommended. The contractor(s) performing the work and/or Radiant's Project Manager will meet with District staff weekly, face-to-face for 4 hours to review progress and ensure timely resolution of any outstanding issues. Questions of scope clarification will be submitted by the contractor, via email, to the District technical lead assigned to the project and a copy sent to the District Project Manager.

Project Partners

- Radiant Systems, Inc.
- South Florida Water Management District

Scope

In-Scope

Task 1

Understand and signoff on programming standards and programming environment.

Time Estimate: 32 hours

Deliverable(s): 1) Sign-Off

Task 2

Inventory and migrate existing applications to a server-based environment with version and source control.

Time Estimate: 40 hours

Deliverable(s): 1) Migrated Application(s) and application inventory

Task 3

Detailed Requirements Analysis to include, but not limited to:

- 1) Documenting Business Priorities of RAD specifically targeting the tasks defined in this work order with a basic identification and understanding of other reports produced by the work unit
- 2) Data Mapping, Data Identification, with Subject Material Experts (SMEs)
- 3) Documenting Business Rules
- 4) Determine Performance Criteria as it pertains to response time and run times
- 5) Identify Specific Source and Target Data Bases
- 6) Review specific scientific/business models that will be interfaced with, as in Task6 and Task7
- 7) Web requirements
- 8) Technologies and Tools requirements
- 9) Determine standards and expectations

The above details will assist the Senior Systems Analyst(s) in their development of detailed design documents and user guide(s) as defined in the remaining tasks. The requirements will provide acceptance criteria for subsequent deliverables.

Time Estimate: 240 hours

Deliverable(s): 1) Detailed Statement of Requirements Document (Use case Format)

Task 4

Make modifications to existing Visual Basic.Net code (8 forms, approximately 3000 lines of code) to correct data access processes that create an MS Access XP database and water budget calculations for STAs 1W, 5, and 6. Maintain existing capability to produce table and figure objects for Excel XP worksheets. Provide a twelve-page user guide with instructions for the program used to automate this process. Provide additional program internal documentation for the Visual Basic code.

Time Estimate: 160 hours (40 hours per existing STA budget plus 40 hrs for detailed requirements, testing and analysis)

Deliverable(s): 1) A revised, documented program
2) A twelve-page user guide

Task 5

Automate data retrievals for flow, stage, evaporation, and rainfall from the corporate Oracle database (DBHYDRO) into an MS Access XP database for STA2 using Visual Basic.Net code developed for STAs 1W, 5 and 6 (see Task 3 above). Automate the associated calculations in preparing the annual water budgets by modifying existing Visual Basic.Net code developed for the same task for STAs 1W, 5 and 6. All forms and dialog objects have been previously developed. Up to 2 more dialog objects and/or forms are likely. Create a daily, monthly and annual cell-by-cell water balance program, as was done for STAs 1W, 5, and 6, for STA 2 to assist in optimizing STA operations. Document the new program in code and insure that the user guide produced in Task 4 is updated to reflect the additional STAs. Provide context sensitive help for all forms and dialog objects used in the programs for all STAs.

Time Estimate: 220 hours (220 hours per STA)

Deliverable(s): 1) A revised, documented program for STA2
2) Updated twelve page user guide for STA2
3) Context sensitive help for all application forms and dialog objects.

Task 6

Migrate water budget calculation programs and forms for STAs 1W, 2, 5, and 6 from client application to server side objects to be reusable by any other interface or model. Target interface is Internet Explorer 6.1.

Time Estimate: 240 Hrs

Deliverable(s): 1) Web-enabled program for water budget calculation and reporting for all STAs 1W, 2, 5 and 6.

Task 7

Evaluate the Nutrient Gradient Model produced by Dr. William W. Walker to determine if it will meet the prediction needs of the Everglades Long-Term Plan for Achieving Water Quality Goals ("Long Term Plan"), specifically the project that will establish the numerical relationship between phosphorus inflow and interior marsh phosphorus concentration for each WCA as part of the Long Term Plan. If it does not, participate in selecting a model that will work. If it meets the prediction needs, determine if the model will need any program modifications for simulating flows and loads at all of the inflow structures to the Everglades Protection Area, and make the necessary code changes.

Automate data file retrievals and inputs for simulated model runs. Use existing discharge data and phosphorus concentration data to generate hydrologic and phosphorus loads. Calibrate the model to existing WCA marsh total phosphorus concentrations. Run the model for the study sites and summarize model output in tables and graphic formats.

Time Estimate: 440 Hrs

Deliverable(s): A documented model, operating instructions and model outputs.

Task 8

Automate the monthly Discharge Monitoring Report, which is a permit requirement of all NPDES permits from FDEP used for Stormwater Treatment Areas. The automation should consist of: automatically retrieving water quality and flow data from DBHYDRO, doing the appropriate calculations, and filling in the information required in the report. See attached DMR format.

Time Estimate: 80 hours

Deliverable(s): A documented report, operating instructions and ongoing support as needed.

Task 9

Training on the updated version of the EMA Load Program that a previous contractor was completing, but was unable to train us on before end of engagement. The updated program uses Access to retrieve the water quality and flow data from DBHYDRO and has the ability to calculate Total Nitrogen loads where the older version did not.

Time Estimate: 80 hours

Deliverable(s): A documented load program, operating instructions, demo/training.

Task 10

Support of TOC Settlement Agreement Quarterly Report generation.

The current program is an Excel spreadsheet with embedded Visual Basic Application (VBA) program:

1. Retrieves Total Phosphorous (TP) concentrations data, stage data (for Refuge), and daily flow data (for Shark River Slough and Taylor Slough) from the DBHYDRO database.
2. Calculates and generates tables and figures for the report. Examine moving calculations to the database in the form of views or stored procedures to be executed by the Visual Basic application. Our philosophy is to remove calculations from the user interface. Let the user interface control appearance and let the database encapsulate the data with methods.
3. Links and updates the tables and figures in the Microsoft Word file.

Time Estimate: 80 hours

Deliverable(s): Documentation revisions (documentation is currently available but needs minor modifications). Automatically links the updated figures and tables to Power Point presentation.

Task 11

1. Migrate "System Storage Report" program from client application to server side object to be reusable by any interface.
2. Create a program that will identify specific data for the current daily report during temporary changes on regulation schedule as well seasonal conditions changes (dry to wet season).
3. Document the new programming code.

Time Estimate: 48 hours

Deliverable(s): 24/7 web enabled storage and historical stage information.
Update current user guide to reflect changes.

Task 12

Automate data retrievals for flow, stage, evaporation, and rainfall from the corporate Oracle database (DBHYDRO) into an MS Access XP database for STA1E and STA3/4 using Visual Basic.Net code developed for STAs 1W, 5 and 6 (see Task 3 above). Automate the associated calculations in preparing the annual water budgets by modifying existing Visual Basic.Net code developed for the same task for STAs 1W, 5 and 6. All forms and dialog objects have been previously developed. Up to 2 more dialog objects and/or forms are likely. Create a daily, monthly and annual cell-by-cell water balance program, as was done for STAs 1W, 2, 5, and 6, for STA1E and STA3/4 to assist in optimizing STA operations. Document the new program in code and insure that the user guide produced in Task 4 is updated to reflect the additional STAs. Provide context sensitive help for all forms and dialog objects used in the programs for all STAs.

Time Estimate: 440 hours (220 hours per STA)

- Deliverable(s):**
- 1) A revised, documented program for STA1E and STA3/4
 - 2) Updated twelve page user guide for STA1E and STA3/4
 - 3) Context sensitive help for all application forms and dialog objects.

Out of Scope

Task 13

Automate data retrievals for inflows, outflows, associated water quality data and in-lake water quality data to meet the new Lake Okeechobee Operating Permit reporting requirements. Prioritize data by the source and use them accordingly. Hydrological data are in DBHYDRO but the program may need to retrieve preliminary data from DCVP. Water quality data are again in DBHYDRO but the program may need to use preliminary data (pre-QA/QC'ed data) from the Laboratory Information Management System (LIMS). The permit is expected to be issued in the 1st Quarter of 2004. Building upon the Java-based Nutrient Load engine developed by the Database Programming and Design Section, automate total phosphorus (TP) and any other load calculations, following the specification in the permit. Design and create server side database tables that contain Class I and Class III water quality criteria. Automate generation of water quality tables comparing monthly data collected to Class I and Class III water quality criteria.

Time Estimate: 320 Hrs

Deliverable(s): A documented program and documented SOP

Task 14

Modify the Microsoft Access-based Florida Geological Survey (FGS) DBHYDRO Upload tool to account for recent changes in DBHYDRO database structure.

Time Estimate: 120 Hrs

Deliverable(s): Modified FGS Upload Tool

Task 15

Automated procedure for generating graphics and tables on a monthly basis for a quality assured web-based report. The automated procedure shall involve:

1. Using VBA and Access, automate monthly data retrieval for water quality and quantity data from DBHYDRO for 365 water quality stations and 147 water quantity station (or flow stations) throughout the District (from the Chain of Lakes to Florida Bay). The retrieved data will then be used to display nutrient loads (TN and TP) and flow-weighted mean concentrations (TN and TP). The sites/and stations will be defined in a production Oracle database and referenced by the application. Calculate values on the Oracle server in the form of views or materialized views for query by the retrieval application.
2. Create automated procedures using VBA and Sigma Plot to generate graphs (flow, load, flow-weighted mean concentration (fwmc)) for stations on District structures for 12-month moving period. Calculate the 12-month moving average in the form of a view or materialized view on the Oracle server.
3. For stations located in lakes (other than Lake Okeechobee) generate monthly mean TP and TN concentrations and automate graphics generation (using VBA and Sigma Plot) to display the monthly concentration for a 12-month moving period.
4. For Lake Okeechobee, additional data analysis will be required. Develop an automated procedure to generate notched-box and whisker plots of nutrient concentrations (these plots would be generated using Systat) and contour plots of TN, TP, Chlorophyll-a and Secchi depth (these plots shall generated using Surfer).
5. Retrieve monthly geometric mean concentrations for TN and TP in WCAs from the Oracle database (where the calculations will take place) and generate graphs using Sigma Plot and VBA. Generate

plots of nutrient (TP, SRP, TN, NOx, NH4) and other parameters (Chlorophyll, Salinity, PAR) on a monthly basis for the estuaries (St. Lucie, Caloosahatchee, and Indian River Lagoon).

6. Generate contour plots of TP, TN, Chlorophyll, and Salinity on a monthly basis for Florida Bay.
7. Generate monthly summary tables. Use materialized views to provide the input to the application.

Time Estimate: 600 Hrs

Deliverable(s): Visual Basic program (and/or procedures) that will generate the required graphs and table to be web-enabled on a monthly basis.

Changes in Scope of Services

Any changes to the scope of this project, or deviations from assumptions and constraints as defined in this Statement of Work may result in a change to project duration and/or cost.

Assumptions / Constraints

SFWMD System(s) will be accessible through VPN access provided by SFWMD

Task 5 of the SOW may be expanded to include other requirements which will impact the time and cost estimates associated

Detail requirements sessions will be required as part of each task listed under scope

Radiant Project Team Structure (Proposed)

Radiant Resource Classification	SFWMD Resource Classification	Task(s)	Hours	Rate
Sr. Project Manager	Sr. Project Manager	Project Administration Detail Requirements	240	\$73.00 Hr
Senior Systems Analyst	Senior Systems Analyst/Engineer	Analysis, Design, Construction, Implementation	1168	\$57.00 Hr
Senior Developer	Senior Systems Analyst/Engineer	Analysis, Design, Construction, Implementation	572	\$57.00 Hr
Database Administrator	Senior Systems Analyst/Engineer	Data Base Analysis, Architecture	317	\$57.00 Hr

Deliverables and Payment Plan

Task	Deliverable	Level of Effort (Hours)	Week Due following NTP	Payment
1	Understand and signoff on programming standards and programming environment.	32	1	\$1,824.00
2	Migrate existing applications to a server-based environment with version and source control	40	2	\$2,280.00
3	Detailed Requirements Analysis Phase	240	6	\$15,600.00
4	Water budget calculations for STAs 1W, 5, and 6. User guide with instructions for the program used to automate this process. Additional program internal documentation for the Visual Basic code.	194	9	\$10,269.00
5	Calculations for STA2	242	15	\$14,120.00
6	Migrate water budget calculation programs to server-side objects	264	12	\$15,403.00
7	Nutrient Gradient Model, Documentation, Instructions, and Outputs	484	17	\$28,240.00
8	Automate monthly Discharge Monitoring report / Support	88	19	\$5,134.00
9	Training on the updated version of the EMA Load Program	88	17	\$5,134.00
10	TOC Settlement Agreement Quarterly Report Revisions TOC Settlement Agreement Quarterly Report Documentation	88	19	\$5,134.00
11	Migrated System Storage Report Modified System Storage Report System Storage Report Documentation	53	13	\$3,080.00
12	Calculations for STA1E and STA3/4	484	32	\$28,240.00
	GRAND TOTAL	2297		\$134,458.00

NOTES:

- These are estimated completion times. Miles stones may be billed earlier if completed prior to these times.
- Project Management is built into each of the deliverables from Task 4 thru 12.

Appendix A: Project Plan

ID	Task Name	Work	Duration	Start	Finish
1	Automated Data Evaluation and Reporting	2,297 hrs	165.81 days	Mon 3/29/04	Mon 11/15/04
2	Task1 - Programming Standards and Programming Environment Sign-Off	32 hrs	5 days	Mon 3/29/04	Fri 4/2/04
3	Task2 - Migration of Applications to Server Based Environment - Version 1	40 hrs	5 days	Mon 4/5/04	Fri 4/9/04
4	Task3 - Detailed Requirements Analysis Phase	240 hrs	17.5 days	Mon 4/12/04	Wed 5/5/04
5	Requirements Analysis	200 hrs	12.5 days	Mon 4/12/04	Wed 4/28/04
6	Detailed Statement of Requirements	40 hrs	5 days	Wed 4/28/04	Wed 5/5/04
7	Sign-Off SOR	0 hrs	0 days	Wed 5/5/04	Wed 5/5/04
8	Scheduled Payment	0 hrs	0 days	Wed 5/5/04	Wed 5/5/04
9	Task4 - Water Budget Calculations (STA1W,STA5,STA6)	194 hrs	24.25 days	Wed 5/5/04	Tue 6/8/04
10	Design	40 hrs	5 days	Wed 5/5/04	Wed 5/12/04
11	Construction	154 hrs	19.25 days	Wed 5/12/04	Tue 6/8/04
12	User Acceptance	0 hrs	0 days	Tue 6/8/04	Tue 6/8/04
13	Sign-Off	0 hrs	0 days	Tue 6/8/04	Tue 6/8/04
14	Scheduled Payment	0 hrs	0 days	Tue 6/8/04	Tue 6/8/04
15	Task5 - Calculations for STA2	242 hrs	30.41 days	Tue 6/8/04	Wed 7/21/04
16	Design	44 hrs	5.66 days	Tue 6/8/04	Wed 6/16/04
17	Construction	198 hrs	24.75 days	Wed 6/16/04	Wed 7/21/04
18	User Acceptance	0 hrs	0 days	Wed 7/21/04	Wed 7/21/04
19	Sign-Off	0 hrs	0 days	Wed 7/21/04	Wed 7/21/04
20	Scheduled Payment	0 hrs	0 days	Wed 7/21/04	Wed 7/21/04
21	TASK6 - Migrate Water Budget Calculation Programs	264 hrs	33 days	Wed 5/5/04	Mon 6/21/04
22	Design	40 hrs	5 days	Wed 5/5/04	Wed 5/12/04
23	Construction	224 hrs	28 days	Wed 5/12/04	Mon 6/21/04
24	User Acceptance	0 hrs	0 days	Mon 6/21/04	Mon 6/21/04
25	Sign-Off	0 hrs	0 days	Mon 6/21/04	Mon 6/21/04
26	Scheduled Payment	0 hrs	0 days	Mon 6/21/04	Mon 6/21/04
27	Task7 - Nutrient Gradient Model	484 hrs	60.5 days	Wed 5/5/04	Wed 7/28/04
28	Design	80 hrs	10 days	Wed 5/5/04	Wed 5/19/04
29	Construction	404 hrs	50.5 days	Wed 5/19/04	Wed 7/28/04
30	User Acceptance	0 hrs	0 days	Wed 7/28/04	Wed 7/28/04
31	Sign-Off	0 hrs	0 days	Wed 7/28/04	Wed 7/28/04
32	Scheduled Payment	0 hrs	0 days	Wed 7/28/04	Wed 7/28/04
33	Task8 - Monthly Discharge Monitoring Report	88 hrs	11 days	Thu 7/29/04	Thu 8/12/04
34	Design	16 hrs	2 days	Thu 7/29/04	Fri 7/30/04
35	Construction	72 hrs	9 days	Mon 8/2/04	Thu 8/12/04
36	User Acceptance	0 hrs	0 days	Thu 8/12/04	Thu 8/12/04
37	Sign-Off	0 hrs	0 days	Thu 8/12/04	Thu 8/12/04
38	Scheduled Payment	0 hrs	0 days	Thu 8/12/04	Thu 8/12/04

ID	Task Name	Work	Duration	Start	Finish
39	Task9 - Training EMA Load Program	88 hrs	11 days	Wed 7/21/04	Thu 8/5/04
40	Training	88 hrs	11 days	Wed 7/21/04	Thu 8/5/04
41	Sign-Off	0 hrs	0 days	Thu 8/5/04	Thu 8/5/04
42	Scheduled Payment	0 hrs	0 days	Thu 8/5/04	Thu 8/5/04
43	Task10 - TOC Quarterly Report Revisions/Documentation	88 hrs	11 days	Thu 8/5/04	Fri 8/20/04
44	Support	88 hrs	11 days	Thu 8/5/04	Fri 8/20/04
45	Sign-Off	0 hrs	0 days	Fri 8/20/04	Fri 8/20/04
46	Scheduled Payment	0 hrs	0 days	Fri 8/20/04	Fri 8/20/04
47	Task11 - Migrated/Modified System Storage report	53 hrs	6.63 days	Mon 6/21/04	Wed 6/30/04
48	Migrate System Storage report to Server Side	8 hrs	1 day	Mon 6/21/04	Tue 6/22/04
49	Program Construction	37 hrs	4.63 days	Tue 6/22/04	Tue 6/29/04
50	Documentation	8 hrs	1 day	Tue 6/29/04	Wed 6/30/04
51	Sign-Off	0 hrs	0 days	Wed 6/30/04	Wed 6/30/04
52	Scheduled Payment	0 hrs	0 days	Wed 6/30/04	Wed 6/30/04
53	Task12 - Calculations for STA1E and STA3/4	484 hrs	60.81 days	Mon 8/23/04	Mon 11/15/04
54	Design	88 hrs	11.31 days	Mon 8/23/04	Tue 9/7/04
55	Construction	396 hrs	49.5 days	Tue 9/7/04	Mon 11/15/04
56	User Acceptance	0 hrs	0 days	Mon 11/15/04	Mon 11/15/04
57	Sign-Off	0 hrs	0 days	Mon 11/15/04	Mon 11/15/04
58	Scheduled Payment	0 hrs	0 days	Mon 11/15/04	Mon 11/15/04